What is claimed is:

1. An industrial robot comprising:

a robot controller,

an end effector for holding a first work piece to be mated to a second work piece held at a location and orientation not precisely known to said robot controller,

a predetermined number of articulated joints, each joint having its own actuation device and motion measurement device,

said robot controller responsive to force measurements from said robot for superimposing on said force measurement at least one force vector that subjects said end effector to a force that causes said end effector to move said first work piece towards said location and orientation in which said second work piece is held.

2. The industrial robot of claim 1 wherein said robot controller further comprises means for providing a velocity command for driving each of said actuation devices to minimize the force upon contact of said first and second work pieces.

3. The industrial robot of claim 2 wherein said robot has a signal for driving each of said predetermined number of actuation devices and when said end effector makes contact with said location and orientation in which said second work piece is held said robot controller superimposes on said driving signal a search velocity pattern in at least two directions and orientations that makes mating of said work pieces possible to cause said end effector to bring said first work piece in contact with said second work piece.

4. The industrial robot of claim 3 wherein said superimposed search velocity pattern continues after said first and second work pieces first come into contact until said first and second work pieces mate.

5. The industrial robot of claim 1 wherein said

force vector is continued when said first and second work pieces come into contact to aid the mating of the work pieces.

6. The industrial robot of claim 2 wherein said means for providing said velocity command is an admittance controller.

7. The industrial robot of claim 2 where before said means for providing said velocity command is activated, position control is used by said robot controller to bring said first work piece to a starting point for assembly with said second work piece.

8. The industrial robot of claim 7 where after said means for providing said velocity command is activated, said position control is disabled in said robot controller and only said velocity command is enabled.

9. The industrial robot of claim 6 where said admittance controller provides said velocity command in response to said force measurement.

10. The industrial robot of claim 2 wherein said means for providing said velocity command is a control filter responsive to said force vector.

11. The industrial robot of claim 9 further comprising a force/torque sensor mounted on said robot, said sensor providing said force measurement.

12. The industrial robot of claim 9 further comprises means for estimating said force measurement.

13. The industrial robot of claim 12 wherein said means for estimating said force measurement comprises a force estimator and said industrial robot further comprises a dithering generator connected to said actuation devices for each of said predetermined number of articulated joints.

14. A method for operating an industrial robot that has a robot controller, an end effector for holding a first work piece to be mated to a second work piece held at a location and orientation not precisely known to said

robot controller, and a predetermined number of articulated joints, each joint having its own actuation device and motion measurement device, said method comprising:

superimposing on a force measurement from said robot at least one force vector that subjects said end effector to a force that causes said end effector to move said first work piece towards said location and orientation in which said second work piece is held.

15. The method of claim 14 further comprising providing from said robot controller a velocity command for driving each of said actuation devices to minimize the force upon contact of said first and second work pieces.

16. The method of claim 14 further comprising providing a signal for driving each of said predetermined number of actuation devices and when said end effector makes contact with said location and orientation in which said second work piece is held superimposing on said driving signal a search velocity pattern in at least two directions and orientations that makes mating of said work pieces possible to cause said end effector to bring said first work piece in contact with said second work piece.

17. The method of claim 16 wherein said superimposed search velocity pattern continues after said first and second work pieces first come into contact until said first and second work pieces mate.

18. The method of claim 14 wherein said force vector is continued when said first and second work pieces come into contact to aid the mating of the work pieces.

19. The method of claim 14 further comprising using position control to bring said first work piece to a starting point prior to superimposing said at least one force vector.

20. The method of claim 15 further comprising where before said velocity command is provided position control is used to bring said first work piece to a starting point for assembly with said second work piece.

21. The method of claim 20 where after said velocity command is provided, said position control is disabled.